

Application No. 09/680,045
Amendment "A" dated June 24, 2004
Reply to Office Action mailed May 13, 2004

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AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (~~Canceled~~) In a database management system that includes a database engine that accesses and updates objects in a database, the database engine receiving high-level document commands, each high-level document command for performing an operation on a document that is associated with a plurality of tables in the database, a method for reliably notifying client applications of the implementation of particular high-level document commands in the database, the notification surviving even system failures, the method comprising the following:

an act of implementing a high-level document command in the database;

an act of

altering a persistently stored notification table to reflect the implementation of the high-level document command in the database;

an act of identifying one or more client applications that are to be notified of the implementation of the high-level document command;

an act of dispatching a notification of the implementation to the one or more identified client applications;

an act of receiving acknowledgement from the one or more client applications that the notification has been received; and

in response to receiving acknowledgement, an act of altering the notification table to reflect that the client application no longer needs to be notified of the implementation of the high-level document command in the database.

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2. (Currently Amended) The method in accordance with Claim 32~~1~~, wherein the notification table is stored in the database.

3. (Currently Amended) The method in accordance with Claim 32~~1~~, wherein the act of dispatching a notification of the implementation to the one or more ~~identified~~-client applications requiring such notification comprises an act of transmitting a message to a machine that hosts the client application, the machine that host the client application being different than the machine that hosts the database management system.

4. (Currently Amended) The method in accordance with Claim 32~~1~~, wherein the act of dispatching a notification of the implementation to the one or more ~~identified~~-client applications requiring such notification comprises an act of passing the notification through a function call to the identified client application, the client application hosted by the same machine as at least the portion of the database management system responsible for performing the act of dispatching the notification.

5. (~~Canceled~~) The method in accordance with Claim 32~~1~~, wherein the act of implementing a high-level document command in the database and the act of altering a persistently stored notification table to reflect the implementation of the high-level document command in the database are atomically performed, the acts of implementing and altering either both occurring or both not occurring at all.

6. (Currently Amended) The method in accordance with Claim 32~~1~~, wherein the act of implementing a high-level document command in the database and the act of altering a persistently stored notification table to reflect the implementation occur in the same transaction of a database engine.

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7. ~~(Canceled)~~ The method in accordance with Claim 1, wherein the document comprises an electronic mail message.

8. ~~(Canceled)~~ The method in accordance with Claim 1, wherein the document comprises a folder.

9. (Currently Amended) The method in accordance with Claim ~~324~~, wherein the act of implementing the high-level document command in the database comprises an act of moving the document.

10. (Currently Amended) The method in accordance with Claim ~~324~~, wherein the act of implementing the high-level document command in the database comprises an act of deleting the document.

11. (Currently Amended) The method in accordance with Claim ~~324~~, wherein the act of implementing the high-level document command in the database comprises an act of copying the document.

12. (Currently Amended) The method in accordance with Claim ~~324~~, wherein the act of implementing the high-level document command in the database comprises an act of adding the document.

13. (Currently Amended) The method in accordance with Claim ~~324~~, wherein the act of implementing the high-level document command in the database comprises an act of updating the document.

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14. (Canceled) The method in accordance with Claim 1, wherein the received acknowledgement indicates that the client application has received the notification.

15. (Currently Amended) The method in accordance with Claim 32, wherein the received acknowledgement indicates that the client application has implemented processes in response to the notification.

16. (Currently Amended) In a database management system that includes a database engine that accesses and updates objects in a database, the database engine receiving high-level document commands, each high-level document command for performing an operation on a document that is associated with a plurality of tables in the database, a method for reliably notifying client applications of the implementation of particular high-level document commands in the database, the notification surviving even system failures, the method comprising the following:

an act of implementing a high-level document command in the database; and

a step for ensuring ~~a corresponding asynchronous notification about of~~ the high-level document command's implementation by preserving the high-level command ~~is preserved until~~ all of the client applications to be notified acknowledge at least receipt of the notification, thereby insuring that the client applications to be notified do not affect the implementation of the high-level document command since the implementation takes place prior to such notification.

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17. (Currently Amended) The method in accordance with Claim 16, wherein the step for ensuring ~~a corresponding~~ asynchronous notification about the high-level document command is preserved comprises the following:

an act of altering a persistently stored notification table to reflect the implementation of the high-level document command in the database;

an act of identifying one or more client applications that are to be notified of the implementation of the high-level document command;

an act of dispatching a notification of the implementation to the one or more identified client applications;

an act of receiving acknowledgement from the one or more client applications that the notification has been received; and

in response to receiving acknowledgement, an act of altering the notification table to reflect that the client application no longer needs to be notified of the implementation of the high-level document command in the database.

18. (Original) The method in accordance with Claim 16, wherein the notification table is stored in the database.

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19. (Canceled) A computer program product for use in a database management system that includes a database engine that accesses and updates objects in a database, the database engine receiving high-level document commands, each high-level document command for performing an operation on a document that is associated with a plurality of tables in the database, the computer-program product for implementing a method for reliably notifying client applications of the implementation of particular high-level document commands in the database, the notification surviving even system failures, the computer program product including a computer-readable medium having stored thereon computer-executable instructions for performing the following:

an act of causing a high-level document command to be implemented in the database;

an act of causing a persistently stored notification table to be altered to reflect the implementation of the high-level document command in the database;

an act of identifying one or more client applications that are to be notified of the implementation of the high-level document command;

an act of causing a notification of the implementation to be dispatched to the one or more identified client applications;

an act of detecting receipt of acknowledgement from the one or more client applications that the notification has been received; and

in response to receiving acknowledgement, an act of causing the notification table to be altered reflect that the client application no longer needs to be notified of the implementation of the high-level document command in the database.

20. (Currently Amended) The computer program product in accordance with Claim 3319, wherein the computer-executable instructions for performing the act of causing a notification of the implementation to be dispatched to the one or more identified client applications comprise computer-executable instruction for performing an act of causing a message to be transmitted to a machine that hosts the client application, the machine that hosts

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the client application being different than the machine that hosts the database management system.

21. (Currently Amended) The computer program product in accordance with Claim 3319, wherein the computer-executable instructions for performing the act of causing a notification of the implementation to be dispatched to the one or more identified client applications comprises computer-executable instructions for performing an act of causing the notification to be passed through a function call to the identified client application, the client application hosted by the same machine as at least the portion of the database management system responsible for performing the act of dispatching the notification.

22. (Canceled) The computer program product in accordance with Claim 19, wherein the computer-executable instructions for performing the act of implementing a high-level document command in the database and the computer-executable instructions for performing the act of altering a persistently stored notification table to reflect the implementation of the high-level document command in the database are configured to atomically performing the acts of implementing and the act of altering.

23. (Canceled) The computer program product in accordance with Claim 19, wherein the document comprises an electronic mail message.

24. (Canceled) The computer program product in accordance with Claim 19, wherein the document comprises a folder.

25. (Currently Amended) The computer program product in accordance with Claim 3319, wherein the computer-executable instructions for performing the act of causing the high-level document command to be implemented in the database ~~comprises~~ comprise computer-executable instructions for performing an act of moving the document.

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26. (Currently Amended) The computer program product in accordance with Claim 3319, wherein the computer-executable instructions for performing the act of causing the high-level document command to be implemented in the database comprises comprise computer-executable instructions for performing an act of deleting the document.

27. (Currently Amended) The computer program product in accordance with Claim 3319, wherein the computer-exccutable instructions for performing the act of causing the high-level document command to be implemented in the database comprises comprise computer-executable instructions for performing an act of copying the document.

28. (Currently Amended) The computer program product in accordance with Claim 3319, wherein the computer-executable instructions for performing the act of causing the high-level document command to be implemented in the database comprises comprise computer-exccutable instructions for performing an act of adding the document.

29. (Currently Amended) The computer program product in accordance with Claim 3319, wherein the computer-executable instructions for performing the act of causing the high-level document command to be implemented in the database comprise computer-executable instructions for performing an act of updating the document.

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30. ~~(Canceled)~~ In a database management system that includes a database engine that accesses and updates tables in a database, the database engine receiving high-level document commands, each high-level document command for performing an operation on a document that is associated with a plurality of tables in the database, a method for recovering from a database management system failure while allowing notifications that were to be sent but for the failure to be sent to one or more client applications upon restarting the database management system, the method comprising the following:

an act of examining a notification table upon restarting the database management system, the notification table identifying implemented high-level document commands for which one or more client applications should be notified;

based on the examination of the notification table, an act of identifying a notification that should have been sent to the one or more client applications, but for which acknowledgement has not been received from the one or more client applications; and

an act of dispatching the notification of the implementation to the one or more identified client applications.

31. ~~(Canceled)~~ The method in accordance with Claim 30, further comprising the following:

an act of receiving acknowledgement from the one or more client applications that the notification has been received; and

in response to receiving acknowledgement, an act of altering the notification table to reflect that the client application no longer needs to be notified of the implementation of the high-level document command in the database.

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32. (New) In a computing system comprised of an operating system and client applications, and that includes,

on one side of the operating system, i) a database application for generating high-level document commands that relate to operations to be performed on a document such as a folder, a file, a message or other such entities that are identified at the level of client applications that use the system, and ii) a database engine for receiving the high-level commands from the database application and then implementing them by executing object commands passed to an operating system, and

on the other side of the operating system, a database containing one or more tables each comprised of objects that define various properties of one or more documents, and wherein the objects contained in the database tables are updated in response to the object commands received from the operating system,

a method for asynchronously notifying client applications of the implementation of particular high-level document commands so that such notification survives even failures of either the database engine or client applications, and wherein the method is comprised of performing the following acts:

the database application issuing one or more high-level document commands which are to be implemented;

either i) before implementing an issued high-level document command, or ii) at the same time that any other table of the database is updated, the database engine altering a persistently stored notification table by creating a notification entry to reflect the implementation of the issued high-level document command, with the result that the client applications do not affect the implementation of the high-level document command since the implementation takes place prior to notification of the client applications, even in the event of failure of either database or the client application, because either,

for case i), no tables in the database are updated until such failure is restored and notification of implementation is verified by at least one of the client applications to the database engine of the operating system, or

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for case ii), all tables in the database are updated in the same transaction used to create the notification entry when updating the persistently stored notification table of the database engine of the operating system; and

dispatching from the operating system a notification of the implementation of the issued high-level document command to one or more client applications requiring such notification;

receiving acknowledgement from at least one of the one or more client applications that the notification has been received; and

in response to receiving acknowledgement, the database engine altering the notification table to reflect that no client applications any longer need to be notified of the implementation of the high-level document command.

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33. (New) In a computing system comprised of an operating system and client applications, and that includes,

on one side of the operating system, i) a database application for generating high-level document commands that relate to operations to be performed on a document such as a folder, a file, a message or other such entities that are identified at the level of client applications that use the system, and ii) a database engine for receiving the high-level commands from the database application and then implementing them by executing object commands passed to an operating system, and

on the other side of the operating system, a database containing one or more tables each comprised of objects that define various properties of one or more documents, and wherein the objects contained in the database tables are updated in response to the object commands received from the operating system,

a computer program product comprised of computer-executable instructions for implementing a method for asynchronously notifying client applications of the implementation of particular high-level document commands so that such notification survives even failures of either the database engine or client applications, and wherein the method is comprised of performing the following acts:

the database application issuing one or more high-level document commands which are to be implemented;

either i) before implementing an issued high-level document command, or ii) at the same time that any other table of the database is updated, the database engine altering a persistently stored notification table by creating a notification entry to reflect the implementation of the issued high-level document command, with the result that the client applications do not affect the implementation of the high-level document command since the implementation takes place prior to notification of the client applications, even in the event of failure of either database or the client application, because either,

for case i), no tables in the database are updated until such failure is restored and notification of implementation is verified by at least one of the client applications to the database engine of the operating system, or

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for case ii), all tables in the database are updated in the same transaction used to created the notification entry when updating the persistently stored notification table of the database engine of the operating system; and

dispatching from the operating system a notification of the implementation of the issued high-level document command to one or more client applications requiring such notification;

receiving acknowledgement from at least one of the one or more client applications that the notification has been received; and

in response to receiving acknowledgement, the database engine altering the notification table to reflect that no client applications any longer need to be notified of the implementation of the high-level document command.